PAL SYSTEM

Technical Note

PAL3 System

PAL3 Firmware Release History

Product Version	Product Release Supported Systems	Build Versions
1.3.0	TriPlus RSH	1.3.11250.2
1.3.1	TriPlus RSH	1.3.12068.1922
1.3.2	TriPlus RSH	1.3.12153.939
1.4.0	TriPlus RSH	1.4.12081.2343
1.4.1	TriPlus RSH	1.4.12333.958
1.4.1.1	TriPlus RSH	1.4.13147.1450
1.5.0	PAL RTC	1.5.13025.0842
1.6.0	TriPlus RSH	1.6.13085.1614
1.6.0.1	TriPlus RSH	1.6.13158.1226
2.0.0	TriPlus Systems	2.0.13268.1155
2.0.0	PAL3 Systems	2.0.13330.1556
2.1.1	PAL3 Systems	2.1.14139.0857
2.1.3	PAL3 Systems	2.1.15029.1357
2.2.1	PAL3 Systems	2.2.15175.0039

Original Instructions

1. Preface

1.1. Warranty and Disclaimer

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1.2. Printing History

PAL3 Firmware Product Version	Date	Author
1.3.11250.2 (1.3.0) Published as part of the Service Manual Edition 01.	February 2012	BBa
Topics for software versions 1.3.1 and 1.4.0 added.	March 2012	BBa
Topics for software version 1.3.2, No 17 and 18 added.	April 2012	BBa
Release History topics No. 57 and 58 added.	May 2012	BBa
Release History topic No. 59 added.	June 2012	BBa
Release History topics 60 to 70 added.	November 2012	BBa
Release History topics 71 to 90 added.	January 2013	BBa
Release History topics 91 to 102 added.	April 2013	BBa
Release History topics 103 to 105 added.	June 2013	BBa
Release History topics 106 to 134 added.	November 2013	BBa
Release History topics 135 to 152 added.	May 2014	BBa
Release History topics 153 to 160 added. Topic 144 deleted.	July 2014	GN
Release History topic 161 added.	February 2015	GN
Release History topics 162 to 181 added.	June 2015	GN

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2. PAL3 Firmware Release History

Firmware History Topics for Software Product Versions: 1.3.0; 1.3.1; 1.3.2; 1.4.0, 1.4.1, 1.5.0, 1.6.0 Hotfixes 1.4.1.1 and 1.6.0.1 2.0.0; 2.1.1, 2.1.3, 2.2.1

No.	Cat.	Modification Description	Product Version
181	I	Minimum adjustable temperature for cooled stacks raised to 4°C.	2.2.1
180	N	Support for PAL Extension Module implemented.	2.2.1
179	N	New types of objects (Liner/Liner types and Cartridges/Cartridge types) implemented for the use with specific/customized tools.	2.2.1
178	I	In case of a fatal error, a text file 'FatalErr.txt' with the error message and some explanatory text will be written to a USB stick (if present)	2.2.1
177	N	Using the two new parameters 'Temp. Gain' and 'Temp. Offset' a linear two point calibration can be performed for modules and tools with temperature control. The calibration procedure can only be performed in Service Mode, while the values of the two parameters can be viewed read-only within the Extended User Level.	2.2.1
176	N	Support for Dual-Head operation has been implemented. The following combinations are permitted: RTC/RTC, RTC/RSI, RSI/RTC and RSI/RSI.	2.2.1
175	I	The Parameter 'Ndl Guide Type' has been moved from Extended User Level to User Level.	2.2.1
174	N	The functionality of the Local Scripts is thought for customers whose CDS does not support the PAL3 System. Using local scripts it is possible to create, edit and execute Jobs using different methods that are based on templates. The templates are provided for different injection techniques like Liquid-Injection, ITEX, Headspace or SPME.	2.2.1
173	E	The default Home Position on the X-Axis has been set to 260 mm.	2.2.1
172	I	A faulty Drive Belt of the Agitator will produce a warning message.	2.2.1
171	N	Additional syringe adapter for the PAL LSI implemented. (D8x65, D8x57, and D7x85)	2.2.1
170	N	Support for customized "generic" Tools implemented.	2.2.1
169	E	Support for an optional separate teaching of Wash-1, Wash-2 and Waste of a Fast Wash module.	2.2.1
168	N	Introduction of the new ITEX Tool and the corresponding ITEX Script.	2.2.1

No.	Cat.	Modification Description	Product Version
167	N	The length of the X-Axis is now measured by the system during drive calibration. The result is shown by the read-only parameter 'Total Axis Length' under 'Drives'.	2.2.1
166	C	The "copy module" functionality has been removed for those modules, where it leads to identical results like the "create new module" functionality.	2.2.1
165	E	The activity MoveToObject() can now be used without the touch-down, by setting the parameter "TouchDown" to false.	2.2.1
164	N	Support for uncooled stacks (6DW with 3 drawers and 12MT with 6 drawers) has been added.	2.2.1
163	N	An additional parameter 'Temp. Setpoint' has been added for all modules and tools with temperature control. This parameter is read-only and shows the actual target temperature.	2.2.1
162	N	The stop-button of the terminal can be deactivated by a client. In this case the processing of a sample cannot be interrupted using the stop button.	2.2.1
161	C	As soon as a tool with heating functionality (HS or ITEX) is mounted, the temperature will be set to the standby temperature.	2.1.3
160	D	The parameters 'DrawerOpenSpeed' and 'DrawerCloseSpeed' have been made accessible in 'Extended User Level'. They were previously only accessible from the 'Service' access level.	2.1.1
159	I	The default values for the parameters 'DrawerOpenSpeed' and 'DrawerCloseSpeed' have both been set to 80 %.	2.1.1
158	I	RackRectangle has been renamed to Rack, WellplateRectangle has been renamed to Wellplate.	2.1.1
157	C	Custom templates will be preserved in case of a software update.	2.1.1
156	C	Corrections in template 'Copy Object'. It has been observed that a copied object has been lost when the system has been powered-off. Creating a 'New Object' did behave correctly.	2.1.1
155	C	Agitator Module chopper frequency for Agi-Drive reduced to enhance lifetime of the unit.	2.1.1
154	E	SPME Fiber Conditioning Module temperature range enhanced from 320 to maximum 350 °C.	2.1.1
153	C	SPME Fiber Conditioning Module check for impedance of heater has been corrected to avoid a wrong negative error message.	2.1.1
152	I	In the object 'Rack', a new item has been added, 'Rack Item'. The selectable parameters are magnetic or non-magnetic Vial Types. The item 'Cap Type' has been integrated into 'Rack'. The 'Needle Guide Type' has to be matched accordingly.	2.1.0

No.	Cat.	Modification Description	Product Version
151	I	The concept of 'VolatileVial' has been replaced by 'VolatileObject'. This concept allows in future applications other types such as cartridges or liners.	2.1.0
150	I	The parameter 'RackType Penetration Vial Index' has been renamed 'PenetrationItemIndex'.	2.1.0
149	I	'Vial Type' Objects moved to a new category, 'Rack Items'.	2.1.0
148	I	The parameter 'Vial Type' of the Rack has been renamed 'Rack Item'.	2.1.0
147	I	The zero pint of the reference position for geometry definition has been changed for the following item types: Well Plate Types, Rack Types, and Tray Adapter Types. Position moved from lower corner (min-x, min-y, max-z) to upper corner with minimal positive x, y, z- coordinates.	2.1.0
146	I	The overlapping logic linked to the object 'Agitator' has been enhanced to be also used for the object class 'Trays'. Typical application is 'Headspace Out of Tray'.	2.1.0
145	C	In the Wash Module 'Waste' position, the names for the parameter Vial Type have been revised. ('WasteInsert' to 'Waste Insert'; 'WastePort' to 'Waste Port'.)	2.1.0
144	E	A target position outside of the axes limits is displayed. This may occur if e.g. the Activity 'MoveRelative' is used by applying parameter values out of range, or if the X-Axis has been wrongly defined.	2.1.0
143	E	The 'Activity' 'SetSignal' has been enhanced by a new mode, allowing a static signal to be set, and turn signal ON/OFF. Turning the signal on/off should not be confused with "triggering" a signal, which is typically used for 'Ready' or 'Start' signals. Note: 'Activities' are used for script developments.	2.1.0
142	N	New PALmodule 'LCMS-P Tool' and the corresponding 'PumpModule' have been added. The combination of the LCMS-P Tool and the Wash Module is comparable to the PAL-xt 'DLW Module'.	2.1.0
141	N	PALmodule 'Dilutor' and 'Dilutor Tool' added. To the Dilutor Module a new class, 'Needle Type', has been added. The Dilutor Syringes have replaceable needles.	2.1.0
140	N	Templates have been enhanced which allows creating 'Custom Objects'. Custom Objects can have a customized geometry and can be imported/exported using the template capabilities. The following object classes are new: Custom Tray Container Types, Custom Tray Adapters Types, Custom Slot Types, Custom Rack Types and Custom Well Plates Types.	2.1.0

No.	Cat.	Modification Description	Product Version
139	N	A new class, 'Tray Container Type' has been added. This enhancement allows e.g. handling cartridges for SPE.	2.1.0
138	N	Templates for Import/Export of objects have been added. The following object classes are affected: Tray Container Types, Tray Adapters Types, Tray Slot Types, Trays (Racks and Well Plates), Vial Types, Valve Types, LC Injector Types, Syringes Types, and Needle Types. Original templates are protected as 'read-only'. If copied, the parameters then become editable. Newly- created objects can be exported to an external storage device (USB stick). Saved objects can be imported.	2.1.0
137	N	New type of LC Injector added, LC Injector SA. This is a passive PALmodule, the injector inlet is defined as a standalone device (SA) but an LC Valve or a Valve Drive is not linked to it. Typical application is e.g. 'Flow Injection'.	2.1.0
136	N	The activities 'SoftwareInput' and 'SoftwareOutput' have been added. This allows a software handshake for software integrations using scripts. This new feature eliminates the need for a hardware handshake.	2.1.0
135	N	In the class 'Trays' a new list item has been added, 'ItemPosition'. This allows addressing a single item (Vial or Object) as standalone item, not linked to a Tray Holder.	2.1.0
134	L	SPME and headspace techniques are not supported with PAL LSI.	2.0.0
133	L	SPME1 is not supported with PAL RSI.	2.0.0
132	L	The needle penetration depth for SPME1 is limited 25 mm. The new Agitator cover type (perforated) gives this mechanical limitation.	2.0.0
131	L	The PALtool adapter parameters 'Location' and 'BasePlate height' are only visible in access level 'Service'.	2.0.0
130	N	An adjustment of the temperature offset for the Agitator Module is available in access level 'Service'. Temperature Offset can be varied in a range of +/- 10 °C.	
129	E	10 mL Syringe is accepted for LC-injections. Bottom Sensing is active.	2.0.0
128	E	RobotArm parameter 'Acceleration Factor' is newly available in access level 'Extended user'. Acceleration to move to and move away from an object is adjustable.	2.0.0

No.	Cat.	Modification Description	Product Version
127	D	Service issues 'Missing/Incomplete RobotArm' adapted to new available PAL3 models 'PAL LSI' and PAL RTC'. Following situations are covered: - Change Robot Type: If the PAL3 model is changed to another type (e.g. PAL RTC to PAL RSI) are the teaching data deleted in the data base. - Replace RobotArm: If the PALhead has to be exchanged by the same type (no change of the PAL3 model) are the teaching data saved, not deleted. Remove RobotArm: If the PALhead is removed, the teaching data are deleted in the data base.	2.0.0
126	I	Startup performance optimized to shorten time required until system is idle.	2.0.0
125	C	Movement of Z-axis in 'FastInjection' mode corrected. Z-Axis is forced to move first in Z-direction at the moment of depentration.	2.0.0
124	C	Recognition time of the USB Stick enlarged to 30 seconds.	2.0.0
123	C	Tray Types definition has been changed to accept single Row or single Column. This allows addressing a single position.	2.0.0
122	E	New factory 'Preset Setting' for 'ITSP' application. (ITSP-S). This feature is limited to specific OEM editions. Currently available for CTC Analytics.	2.0.0
121	E	The utility 'Purge Syringe' has been moved from the object 'RoborArm' to the object 'HS Tool' (headspace tools or 'gas tool'). Note: The utility carries out a tool change if called for a parked tool.	2.0.0
120	E	At the moment of teaching the PALmodules is a check executed to ensure that all positions are within working range. This is valid for PALmodul's Peltier Stacks and Tray Holders (incl. Tray Plate).	2.0.0
119	E	'AnalysisTime=0' is supported in the SPME overlapping mode for 'Timing Run'.	2.0.0
118	E	New parameter in activity 'FastInjectionSampleGc' implemented: 'DepenetrationDelay'. The parameter is activated just before the needle is depentrated from the GC injector.	2.0.0
117	E	Presets for PAL LSI and PAL RSI defined. Factory settings for '1-S'. Bundle configuration includes new tray holder type 'Tray Plate' and for PAL LSI models the syringe adapter 'D7 57'. This feature is limited to specific OEM editions. Currently available for TMO.(Model TriPlus 100LS).	2.0.0
116	E	New Needle Guide Type implemented: 'NonMagn2ml'. This type is used for small caps, typically 1 or 2 mL vials, non-magnetic.	2.0.0

No.	Cat.	Modification Description	Product Version
115	E	Temperature parameters of all heated PALmodules can be accessed by a 'Driver Client' (e.g. Agitator Temperature settings and control). Note: This is not an issue of the PAL3 Firmware but of the 'Integration Driver' (PC). Correction is included in Driver Version 2.0.0.	2.0.0
114	N	New activities added to SPME script: 'FiberPreWash' and 'FiberPostWash'. This feature is limited to specific OEM editions. Currently available for TMO.	2.0.0
113	N	PALterminal content translated into Japanese. This is valid for the Virtual PALterminal as well (PC Application). Note that only part of the content has been translated. This feature is limited to specific OEM editions. Currently available for TMO.	2.0.0
112	N	New activities implanted: 'MoveToPosition', 'MoveRelative', 'MovePlunger', MoveNeedleGuide'. These activities are limited to specific OEM editions. Currently available for CTC Analytics and GST releases.	2.0.0
111	N	New object 'Tray Plate' implemented. Object is available for all PAL3 models. 'Tray Plate' is a tray holder to accept 3 Tray Types with the foot print of a well plate (e.g. VT54) but not the Rack Type R60.	2.0.0
110	N	New 'Waste Type' implemented to dispose vials. Machine-object 'WasteContainer'.	2.0.0
109	N	A vial can be disposed into a waste container. Activity 'DisposeVial'.	2.0.0
108	N	The vial can be transported by inserting the needle in the septum. Activity 'TransportVial' enhanced with 'Needle Transport'.	2.0.0
107	N	New model 'PAL LSI' added to PAL3 family.	2.0.0
106	N	New model 'PAL RSI' added to PAL3 family.	2.0.0
105	L	Maximum number of samples within a sequence in Xcalibur (CDS), when running encrypted methods where overlapping is requested, is limited to 30 samples. Typically methods for SPME or Headspace technique. No limitation for unencrypted methods has been observed.	1.4.1.1
104	C	Correction for running a sequence of samples using an encrypted method. Using the encrypted method previously caused the system to stall after the first sample was processed.	1.6.0.1
103	C	Correction for running a sequence of samples using an encrypted method. Using the encrypted method previously caused the system to stall after the first sample was processed.	1.4.1.1

No.	Cat.	Modification Description	Product Version
102	D	For the Backup/Restore process, a check has been implemented to first verify the software version. In case the version is lower than 1.6.0, a 'Restore' will be denied.	1.6.0
101	D	A software downgrade to an incompatible version is prohibited. A message is displayed to indicate that 'Downgrade to version x.y is not supported'.	1.6.0
100	I	Conducting the link in-between the PALsystem and the CDS has been improved in performance.	1.6.0
99	C	The wizard 'Tray System' prohibits creating a new 'Tray System' if an invalid 'Vial Type' is assigned.	1.6.0
98	E	The 'Pending Message' codes are reported with a new 4 digit error code. Example: M2005[String].	1.6.0
97	E	The 'Valve Type' and valve name are displayed as additional information in the class 'Valve Drive' on the Start Screen.	1.6.0
96	E	The 'Output Signal' has been enhanced by adding a 'DestinationAux'. This allows defining to one logical output two different output signals, e.g. 'SWOut1' and 'SWOut2' used to start two different GC's using a Y-cable.	1.6.0
95	E	In cases when an installed PALtool is not identified, for example in the case of a defective EEPROM, it is now possible to decouple a PALtool and park it in an available slot of the PALtool Station using the activity 'Park Tool'. The functionality of the activity 'ParkTool' has been enhanced. The activity 'Force Park Tool' is obsolete. See item 25.	1.6.0
94	E	The parameter 'Cap Type' is newly displayed in the class 'Trays' (read only).	1.6.0
93	N	The 'Fast Wash Module' can be selected as a wash station in liquid and headspace scripts. Parameter ranges have been adapted accordingly.	1.6.0
92	N	PALterminal content translated into Chinese (simplified). This is valid for the Virtual PALterminal as well (PC Application). Note that only part of the content has been translated.	1.6.0
91	E	The definition of the SPME Parameter 'Penetration Depth' has been changed. Up to software version 1.4.x, the 'Penetration Depth' was measured as the needle length alone, without the Fiber Length. Starting with Software version 1.5.0, the total length, i.e. the Needle and Fiber length combined, is defined as 'Penetration Depth'.	1.5.0
90	D	For the Backup/Restore process, a check has been implemented to first verify the software version. In case the version is lower than 1.5.0, a 'Restore' will be denied.	1.5.0

No.	Cat.	Modification Description	Product Version
89	E	Activating the command 'Check Configuration' (Maintenance) clears resolved System Messages. System Messages are displayed in the status line next to the 'Envelope' icon.	1.5.0
88	N	Description for SGE syringes enhanced with the addition of an order code. OEM specific selection possible.	1.5.0
87	N	Templates for PAL3 Hamilton Syringes have been implemented.	1.5.0
86	N	Parameter 'Cover Type' implemented for PALmodule 'Agitator'.	1.5.0
85	I	The parameter 'X-Axis Length' is visible and can be modified in the 'Extended User' access level.	1.5.0
84	N	Two new activities have been implemented: - RetractNeedleGuide - Lower NeedleGuide.	1.5.0
83	E	The MHE Adapter can be used for pressure balance when a vial (container) is filled with liquid or liquid has been withdrawn. Activity 'PenetrateObject' has been extended accordingly.	1.5.0
82	E	The 'StripVialActivity' used to strip-off a vial with a magnetic cap has been adapted such that a neighboring vial can no longer become accidentally caught.	1.5.0
81	N	SPME2 Tool is implemented. New generation of SPME Holder.	1.5.0
80	N	A closed plunger coupling device can be detected. Prerequisite is that the 'Plunger Check' is activated. A message is propagated in error status.	1.5.0
79	N	The PALmodule 'Peltier Stack 6DW' is implemented.	1.5.0
78	N	The PALmodule 'Peltier Stack 2DW-2T' is implemented. This module '-2T' replaces the previous module 'Peltier Stack 2DW'.	1.5.0
77	N	The PALmodule 'Fast Wash Module' is implemented.	1.5.0
76	N	The PALmodules Valve Drive, Valve, and 'LcInjector' are implemented.	1.5.0
75	E	All PALmodules (active and passive modules) including Signals are displayed with an icon on the Start Screen.	1.5.0
74	C	The wizard 'Adjust Needle Penetration' shows the Index of the vial which will be used for testing the penetration. In the process of 'depenetration' the Needle Guide Drive will run in parallel to the Z-drive to ensure the stripping-off of the vial from the needle.	1.5.0
73	E	The Service Issue Message for 'Incomplete Module' states more precisely the missing device functions. This information helps to identify the missing or defective PALmodule.	1.5.0

No.	Cat.	Modification Description	Product Version
72	E	The error codes for 'Activity Runtime Errors' are reported with a new 4 digit error code. Example: M1137[String].	1.5.0
71	C	The 'Bootloader Version' is newly displayed in the WebInterface.	1.5.0
70	C	Correction in the read-out of the Park Station EEPROM during the active coupling and de-coupling process. This measure enhances the reliability of the Park Station in identifying the PALtool(-s).	1.4.1
69	C	Correction to the PALbus communication flow to avoid unexpected stopping of the system when a PALtool is decoupled during simultaneous execution of other tasks or activities (such as temperature read-out or controlling PALdrives).	1.4.1
68	L	Upgrade and Downgrade Limitations: Updating from PAL Control Software Version 1.4.0 to Version 1.4.1: After a successful update, it is mandatory to calibrate the PALdrives again. *Note: It is recommended to verify the teach positions as well.* Downgrading from PAL Control Software Version 1.4.1 to Version 1.4.0: After a successful downgrade, it is mandatory to calibrate the PALdrives and to teach all positions again. *Note: It is advisable to work through the entire 'Installation Wizard' to follow the correct downgrade procedure and verify proper function of the system.* *Important: It is recommended to use the 'Update' or 'Downgrade' processes as described in the User Manual. The 'Restore' process should be avoided to prevent the restoration of potential errors from previous system condition to the current system.*	1.4.1
67	C	False negative errors have been interpreted by internal comparison of a parameter value with an expected value range. This false negative effect has been observed under special circumstances when a parameter value was equal to cutoff value.	1.4.1
66	C	Virtual PALterminal time-out correction. Communication time-out if duration of an 'Activity' is longer than 1 minute. *Note: This is not an issue of the PAL Control Software but of the 'Integration Driver' (PC). Correction is included in Driver Version 1.4.1.*	1.4.1
65	C	Display of IP Address modified taking into consideration the two IP protocols 'DHCP' and 'Static Address'. If DHCP protocol selected and IP Address not yet assigned by server: 0.0.0.0. If Static IP Address protocol selected: Configured IP Address displayed (display of IP Address even when network cable is not connected).	1.4.1

No.	Cat.	Modification Description	Product Version
64	C	Correction in handling more than one Park Station in combination with Activity 'PickTool'. If 'PickTool' is activated, it first checks if a reference point is set to one of the Park Stations. If a Reference Point is detected, the Activity will continue; if no Reference Point is found, an error message is propagated and the PALsystem will stop.	1.4.1
63	C	Activation of 'Presets' for Thermo standard configuration 'PAL3-L-X-TMO' has been corrected. *Note: See Release History Topics No. 58.*	1.4.1
62	I	PALtool de-coupling procedure modified to ensure release of syringe plunger. De-coupling check built-in; if not released a retry is executed. *Note: The 'Retry' is executed only if the "Check Plunger" is activated.* *Select 'Extended User Level'.* *Path: Options | Setup | PALmodules | RobotArmLeft | Drives | DriveW | Check Plunger.*	1.4.1
61	C	Correction in device firmware to activate the transistor which activates the Purge Valve. A slew rate at activation of the transistor has been implemented.	1.4.1
60	C	Format of Barcode Symbol Types 'I-205' (Interleaved 2 of 5) and 'Code 39' changed to accept 'Any Number of Characters'. Barcode Reader Status changed to 'Operational' at 'Switch-on' and not after reaching 'Ready' status.	1.4.1
59	C	Possible error in Needle Guide Calibration fixed. Error occurred in rare cases when distance of sensor and mechanical stop was very close.	1.3.2
58	L	The so-called 'Presets' cannot be activated for the Thermo standard configuration 'PAL3-L-X-TMO' using the PAL Control Software version 1.4.0 (Thermo bundle no. 4). The 'Presets' for the other five standard Thermo configurations operate smoothly with PAL Control Software version 1.4.0.	1.4.0
57	L	Downgrading the PAL Control Software from version 1.4.0 to 1.3.1 is not possible if a PALcontrol Board with LED is installed. If a downgrade is necessary in this case, software version 1.3.2 is recommended.	1.4.0
56	D	If no Tool Station (Change or Park Station) is present at startup of the PALsystem, a user notification appears and prohibits the running of any cycles.	1.4.0
55	C	A correction has been made which allows in rare cases two CDS applications to connect to the instrument with the same role (GC1/GC2).	1.4.0

No.	Cat.	Modification Description	Product Version
54	C	A check for the 'Plunger Calibration' wizard has been implemented. The calibration values are compared against the measured values, and if a certain tolerance is exceeded an error message 'out of range' is displayed. With this check, a calibration without a plunger inserted can be detected.	1.4.0
53	C	A check has been built in to verify that all PALtools are calibrated before any activity is executed. An error message will be displayed if a PALtool is not 'calibrated'.	1.4.0
52	C	A check for the expected Z-axis position when parking a tool in the Tool Station during the process of 'Change Tool' has been implemented. If in the process of parking a PALtool in the Tool Station, an unexpected obstacle is detected, the process will be stopped and the PALtool will not be decoupled from the PALhead. An error message will be displayed.	1.4.0
51	C	When an 'Abort' of the PALsystem has been executed and other samples have been queued almost immediately, the new queued samples have also been aborted. This behavior has been corrected. Newly-queued samples will no longer be deleted.	1.4.0
50	C	Round-off error in numeric control for speed (rpm) in the module 'Agitator' has been corrected.	1.4.0
49	C	The display of the backup file name and version in the PALterminal and Virtual PALterminal has been corrected. Name, Version, Date, and Time is completely displayed.	1.4.0
48	C	Two syringe templates have been added: - SYT365F2431 (25 µL, Gauge 23S, Needle length 85 mm, point style 'C') - SYH207847 (500µL, Gauge 23, Needle length 85 mm, point style '5')	1.4.0
47	L	In order to reliably perform the check 'Calibrate Plunger Sensor' it is mandatory to insert a syringe with installed plunger in the PALtool. Wizard Setup/Installation.	1.4.0
46	E	Maximum Temperature for the 'SPME Conditioning Module' has been increased from 300 to 350 °C.	1.4.0
45	E	Maximum Temperature for the module 'Agitator' has been increased from 150 to 200 °C.	1.4.0
44	E	A missing active PALmodule during the startup procedure is signaled by a 'Service Issue', shown as a message envelope blinking in the status line. Usability.	1.4.0

No.	Cat.	Modification Description	Product Version
43	E	The wizard 'Teach PALtool Station' has been modified. When two Park Stations are installed, a check based on the X-axis position and (for the Slots) an additional Y-axis positions check have been added to verify that the requested Park Station or Slot is addressed. Furthermore, the PALhead with the engaged PALtool is automatically moved from the first Slot in logical order to the consecutively slots. Usability.	1.4.0
42	E	The 'fine-teach' process has been adapted for the 3-point teaching of Well Plates (MTP). The tool needle guide is lifted by a few millimeters for better visual control. Usability.	1.4.0
41	E	In the screens 'Teach PALmodules' the current teach point vector is displayed in the column 'Actual TP'. The X-, Y-, and Z-axes position values will be updated each time when changed. Usability.	1.4.0
40	E	Submenu for backup tasks eliminated. Menu tree contains the functions 'Create', 'Copy', and 'Restore' on the same level. Usability.	1.4.0
39	E	Current location of a PALtool is displayed on Start screen, coupled in PALhead or parked in Slot #. Usability.	1.4.0
38	E	During the PALmodules teach process, the functionality 'Check Teaching' can be executed. Command is available in pull-up menu 'Options' of the selected page. Usability.	1.4.0
37	E	The PALdevice firmware versions are displayed in the section 'About' with access level rights for 'Service'. Usability.	1.4.0
36	E	The 'Tray Setup Control' has been modified to distinguish between Racks (example R60) and Well Plates (MTP). Usability.	1.4.0
35	E	The wizard 'Teach PALtool Station' moves the PALhead automatically to Slot2 and continuous to Slot3. Usability.	1.4.0
34	E	The wizard 'Adjust Needle Penetration' uses the 'Maximum Needle Penetration' of the specified Vial Type as the limit. Usability.	1.4.0
33	E	In situations where a system reboot is required and automatically executed, a dialog box appears to prompt the operator to first remove the PAL3 USB Stick. Usability.	1.4.0
32	E	After changing the 'Regional Settings' a dialog box appears to inform the operator that a reboot of the PALsystem is necessary to activate the changes. Usability.	1.4.0
31	N	A new configuration validation routine has been added to ensure that the PALsystem is configured as required. Sample execution is prohibited if e.g. PALdrives are not calibrated.	1.4.0
30	N	New PALtool parameter 'NeedleGuideType' added. The 'NeedleGuideType' must be defined and match with the 'CapType' in the class 'Vial Type'. All executed activities will check for compatibility with the selected target. When a mismatch is detected, the script (cycle) will be aborted.	1.4.0

No.	Cat.	Modification Description	Product Version
29	N	A software 'Injected Signal' has been added to the Integration Driver which is triggered approximately at the same time as the hardware-injected signal.	1.4.0
28	N	The PALterminal and the Virtual PALterminal is blocked during a sequence. Changing parameters, creating, modifying, or deleting a PALobject is prohibited. A message will appear explaining that the 'Function is not available…'.	1.4.0
27	N	New function 'Check Configuration' introduced; 'Maintenance' menu item. This function provides the possibility to check the entire system configuration for any mismatches. 'Pending Messages' and/or 'Service Issues' which have been clicked away can be retrieved again.	1.4.0
26	N	New function 'Reset Configuration' introduced; 'Maintenance' menu item. This function allows resetting the configuration as defined for a specific standard application. The so-called 'Presets' define parameters such as the length of the X-axis, the Input/Output Signal settings and hardware required for the specific application. Please note that after executing the 'Reset Configuration' it is necessary to complete the Setup-Installation wizard again.	1.4.0
25	N	New activity 'ForceParkTool' introduced; 'Options' pull-up menu item in class 'RobotArmLeft'. This task is used for emergency cases when a PALtool is not identified in the PALhead. The PALtool is parked in an available slot.	1.4.0
24	N	New function 'Shutdown' introduced; 'Options' pull-up menu item. This function prepares the PAL System for switch off. The PALhead is moved to the next open slot to park if a PALtool is coupled. The PALhead is 'parked' in a defined position. This eliminates the slow downwards movement of the Z-Slider Assembly when the system is powered off. The syringe needle is thus protected by this 'Shutdown' safety feature.	1.4.0
23	N	Enhanced Peltier Stack Module with a second temperature sensor at the front of the drawer is supported. (PALdevice Firmware PalStack2T). Please note that the new type of Peltier Stack Module is not supported by PAL Control Software versions lower than 1.4.0.	1.4.0
22	N	The scheduler has been extended to support encrypted scripts besides current plain text scripts. At the same time, the detail level of the execution log has been reduced in order to avoid the potentially confidential information from the script logic to be reconstructed.	1.4.0

No.	Cat.	Modification Description	Product Version
21	N	LED light on the side cover of the X-axis will show identical status as the Status Light displayed on the PALterminal and Virtual PALterminal. LED light (hardware) built-in with release of software version 1.4.0.	1.4.0
20	N	Support of Microtiter Plates (MTP) including 'Bottom Sensing' mode for wells is provided.	1.4.0
19	N	Compatibility: PAL Control Software version 1.4.0 is backwards compatible with version 1.3.1 but not with lower version 1.3.0.	1.4.0
18	C	With this software version is in the downgrading process from software version 1.4.0 to 1.3.2 the missing PALdevice Firmware of the I/O Interface added.	1.3.2
17	N	Compatibility: PAL Control Software version 1.3.2 is forward compatible and backwards compatible with version 1.3.1 but not with lower version 1.3.0.	1.3.2
16	N	'Configuration Backup' introduced. File is used for Restore process. File extension: '*.pack'. Configuration Backup is forward compatible with PAL Control Software version 1.4.0 or higher but NOT backwards compatible with version 1.3.0. The automated creation of the so-called backup file 'Before Installation' has been eliminated and replaced by the new backup concept.	1.3.1
15	N	Backup file concept changed to 'Diagnostic Backup'. File is mainly used for troubleshooting. File extension: '*.pack'. Configuration Backup is forward compatible with PAL Control Software version 1.4.0 or higher but NOT backwards compatible with version 1.3.0.	1.3.1
14	N	Forward and backwards compatibility for current PALtools and PALmodules with PAL Control Software versions 1.3.1 and 1.4.0. Please note that there is no backwards compatibility with version 1.3.0.	1.3.1
13	C	HS Tool syringe heating logic revised to detect set point under different possible circumstances.	1.3.1
12	C	OC Actuator closing position is verified to avoid second try of closing command.	1.3.1
11	C	OC Actuator closing step delayed to allow withdrawal of syringe needle safely.	1.3.1
10	C	PALhead moves safely to OC-Injector. Collision during the movement from Peltier Stack module to OCI is eliminated. Workaround with setting 'Obstacle' is obsolete.	1.3.1
09	L	Status LED at X-axis Side Cover is not activated by the software. (PCB PALcontrol Rev. F)	1.3.1

No.	Cat.	Modification Description	Product Version
08	N	Compatibility: Software version 1.3.1 is forward compatible but not backwards compatible with version 1.3.0.	1.3.1
07	N	At start of a movement or when the system is idle for longer than 10 seconds, a 'Beep'Alarm is activated.	1.3.0
06	E	Moving the PALhead to a vial position, the 'Search Speed' is used within the Z-axis tolerance. This avoids a hard collision.	1.3.0
05	N	A non PALsystem module can be defined as 'Obstacle'. This allows protecting the area, avoiding a collision with the PALhead.	1.3.0
04	C	Bugfix in overlapping schedule. Resource allocations have been streamlined.	1.3.0
03	N	User action 'Park Tool' in 'Tool' details screen has been added.	1.3.0
02	E	SPME Fiber Conditioning Module 'Standby' and 'Actual' temperatures are displayed in main screen.	1.3.0
01	C	OC-Injector: Teaching figure implies that the Magnetic Ring Adapter has to be removed during the teaching process.	1.3.0

2.1. Code

Cat. = Categories of Modifications

N:	Completely new feature
E:	Enhancement of an existing feature
L:	Important limitation
C:	Correction of a discovered problem
I	Modification to improve performance or maintainability
D	Modification to detect and correct latent faults before they become effective faults